SPHERICAL SUPPORT

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The invention relates to movable support devices, in particular, to spherical supports usable as support elements of machines and tools. One of promising fields to use the spherical support being applied is furniture production.

A spherical support is already known which includes a case with a ring plug having internal surface forming a part of a single spherical cavity where a support sphere is mounted (Application No. 2000095497 of 25.09.2000 on which issue of the patent was approved). However, this known construction has an essential lack, as it has no means to fix a support on surface with which the said support contacts. This, in its turn, results in undesirable shift of the support to this or that direction causing failure to fix or inaccurate fixation of the whole object where the known support sphere is used.

The invention bases itself on a task to secure fixation of the spherical support on contacting surface (for example, floor) at a given point through design change and addition of new elements and change of their interaction.

To this end, the spherical support which includes a case with a ring plug having internal surface forming a part of a single spherical cavity where a support sphere is mounted was supplied with a new version of the ring plug which can move in parallel to a case axis with length of travel exceeding a radius of the support sphere.

At the same time, the ring plug features a movement lock and is connected to the case with a threaded joint. In one of versions of the invention, the lock of the ring plug can be made as a stopper mounted in a through hole in the ring plug.

Another version: the lock of the ring plug is made as a stopper mounted in a through hole in the ring plug having ability to press permanently toward the case, and hollows are made at case surface which interacts with the lock.

In the next design version of the invention, the lock is made as a reversable ratchet gear.

Yet another version of the invention provides that the ring plug has a ring axial bearing rotatable relative to the ring plug, with a rotation axis of the ring axial bearing coinciding with an axis of the ring plug. Here, contact of the support axial bearing with the ring plug can be made along the spherical surface, with a centre of the spherical surface laying on an axis of the ring plug.

There exists a version where the case is connected to the ring plug through a pneumatic actuator. Use of a restoring spring is possible.

In another version, a side of the ring plug opposite to support surface is made as a closed cavity being a case of a pneumatic actuator and, in such case, the case acts as a piston. Yet another version is possible where the case is connected to the ring plug through a pneumatic actuator with a restoring spring.

Additionally, the support surface of the ring plug can be made from a springy material.

A technological result of the invention is in securing the fixation of the spherical support relative to surface with which the spherical support interacts.

The cause-and-effect relation between such technological result and a combination of the invention attributes consists in movability of the ring plug relative to the case of the spherical support, where length of travel in such movement can exceed a radius of the support sphere. In order to fix the spherical support on the support surface, the ring plug moves downwards in such way that the contact between the support sphere and the surface weakens. In such case, the spherical support turns to an ordinary immovable support.

The signs of the invention which describe various design versions of the ring plug etc., do not limit the scope of the invention, but define mainly elementary and most reliable designs.

The drawings explain an essence of the invention.

Fig. 1 shows assembled representation of the spherical support. Designations: 1 - case, 2 - ring plug, 3 - spherical surface, 4 – lock, 5 - axial bearing, 6 - spherical surface between the plug and the axial bearing.

Fig. 2 represents A-A section, where hollows are made at case surface which interacts with the lock having the form of a ratchet gear. Designations: 1 - case, 2 - ring plug, 7 - ratchet, 8 - hollows, 9 - spring for pressing a lock (ratchet).

Fig. 3 represents a version where the case is connected to the ring plug through a pneumatic actuator with a restoring spring.

Designations: 1 - case, 2 - ring plug, 10 - restoring spring.

Fig. 4 shows a version where the ring plug serves as a case of the pneumatic actuator with a restoring spring. Designations: 1 - case, 2 - ring plug, 9 - restoring spring.

The spherical support shown at fig. 1 operates in the following way. If fixation of the support is needed, ring plug 2 by means of the threaded joint moves smoothly in parallel to axis of case 1 until contact with the surface with which the spherical support interacts. Upon this, the ring plug 2 is fixed relative to case 1 by lock 4 preventing further movement.

Optionally, lock 4 is made as a stopper mounted in a through hole in ring plug 2, or having ability to press permanently toward case 1, for example, using spring 9.

For more reliable fixation of ring plug 2 on surface of case 1, hollows 8 are made which interacts with lock 7.

For better convenience in use, the lock can be made in the form of ratchet 7 which interacts with hollows 8 under the action of spring 9 that is shown on fig. 2. The ratchet gear can be reversable for work backward.

As ring plug 2 in moving along the axis of case 1 by means of threaded joint rotates around the same axis, then, when the support surface (floor) contacts with a ring plug 2, friction torque appears which resists to rotation of ring plug 2 relative to case 1. The same friction torque considerably increases in case of attempt to rotate additionally

ring plug 2 upon its support surface contact with the floor, e.g. to adjust height of the support after its fixation. In order to prevent such situation, another version is possible with ring plug 2 having ring axial bearing 5 made rotatable relative to the ring plug 2, a rotation axis of the ring bearing 5 coinciding with an axis of the ring plug 2.

In case that a surface interacting with the spherical support is not perpendicular to the axis of a spherical support, there exists another version where support axial bearing 5 contacts with a ring plug 2 along spherical surface 6, with a centre of spherical surface 6 laying on the axis of ring plug 2. So, when support axial bearing 5 contacts with the support surface, that support axial bearing 5 fix itself along spherical surface 6 relative to ring plug 2 and the support surface. Such design maintains the above function which decreases friction of the support surface of ring plug 2 relative to the floor due to its rotatability relative to ring plug 2.

In order to increase speed and enable automatic fixation, one more version of the support was designed (fig. 3), where case 1 and ring plug 2 in the spherical supports are connected through a pneumatic actuator. In that case, the use of restoring spring 10 expands operability and allows to save compressed air.

In case of need for high axial loads when lifting objects unachievable through measurement of the piston limited by dimensions of the support and actually used pressure (0,5 to 1,0 atm.), a pneumatic actuator with running thread is used that provides significant

axial thrust due to the thread, with a low torque.

If ring plug 2 is made as a closed cavity (fig. 4) becoming the case of a pneumatic actuator, then, when compressed air is supplied to that cavity, case 1 which acts as a piston moves to the support sphere actuating the spherical support. In order to fix the spherical support, air pressure is removed, and the force of restoring spring 10 which coincides with the force of loading moves case 1 away, and the support sphere which loses support on the spherical surface of case 1 also moves away until the support surface of ring plug 2 contacts with a floor.

Finally, the support surface of the ring plug can be made from a springy material increasing traction with the floor due to increasing contact plane, in particular, when the surface interacting with the spherical support is imperfect.

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Authentic translation